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# Online banking customization via tag-based interaction

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**Abstract.** In this paper, we describe ongoing work on online banking customization with a particular focus on interaction. The scope of the study is confined to the Australian banking context where the lack of customization is apparent. This paper puts forward the notion of using tags to facilitate personalized interactions in online banking. We argue that tags can afford simple and intuitive interactions unique to every individual in both online and mobile environments. Firstly, through a review of related literature, we frame our work in the customization domain. Secondly, we define our main idea and identify a range of taggable resources in online banking. Thirdly, we describe our preliminary prototype implementation with respect to interaction customization types. Lastly, we conclude with a discussion on future work.

**Keywords:** website customization, online banking, tags, interaction

## 1 Introduction

The workshop theme is centered on data-centric interaction on the Web. The ever-increasing amount of data available online has lead to a growing interest in exploring its potential use to enhance Web-based interaction. This paper discusses the use of user-contributed data in particular user tags in the online banking space with the aim of delivering a personalized interaction.

This paper is specifically aimed at customization in the online banking context because it is an imperative dimension of user satisfaction, particularly among the younger generation in Australia [1]. This is particularly true as customization allows online banking to be more responsive to the individual needs of each user. According to a survey conducted by Nielsen Australia<sup>1</sup>, online banking is the preferred channel of banking over ATM, phone and branch. However, customization of online banking is still poorly addressed [1]. This paper aims to address this gap.

The rest of this paper is structured as follows. In section 2, the related work on customization is presented and background on the proposed technology is offered. In section 3, the proposed approach is outlined along with results of a background study to identify user taggable resources in online banking. In section 4, the preliminary prototype implementation is detailed with reference to interaction customization types. In section 5, the paper is concluded with discussion on future work.

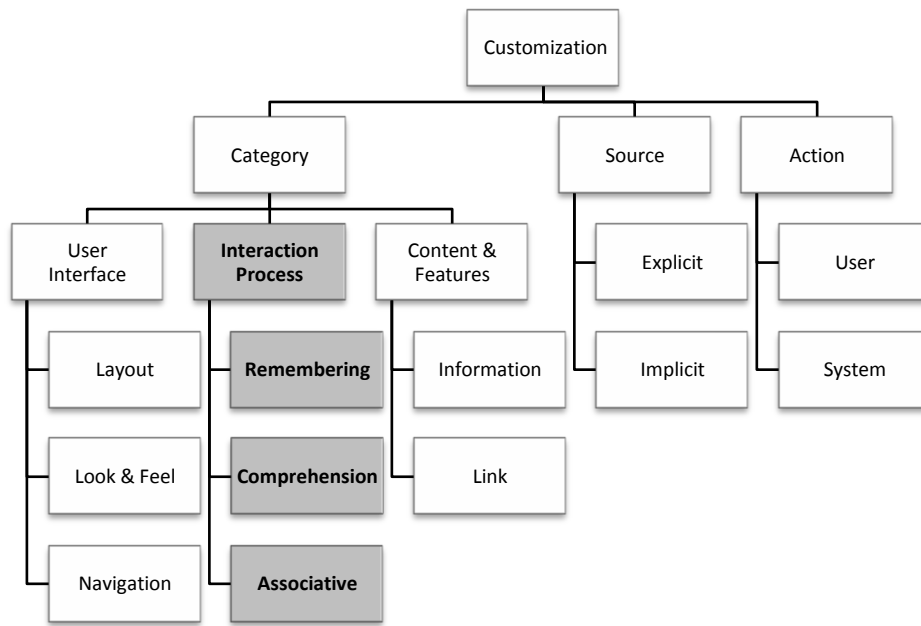
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<sup>1</sup> <http://au.nielsen.com/news/20070426.shtml>

## 2 Related work

### 2.1 Customization overview

Based on the literature, a customization framework has been derived, which offers an overview of the customization domain, and position of the work described in this paper (highlighted). For the purpose of literature review, a broad understanding of customization was adopted defined as “the ability for a website to be shaped in a way that better fulfils the wants of individual users” [1].



**Fig. 1.** Customization Framework

Figure 1 is derived from the literature based on previous work on performance personalization system [2], user interface customization [3], interaction process customization [4] and personalization framework [5].

The diagram illustrates three key dimensions of customization: category, source and action. Three *categories* of customization are *user interface*, *interaction process* and *content & features*. These categories can be further expanded into finer attributes or levels. *Sources* used to facilitate these different customization categories can be divided into two: *explicit* and *implicit*. The former includes data sources which are personal and overt such as cookies, user profiles and personal tools. The latter covers data sources that are complex which provide latent information about user’s website usage or behavior such as usage logs or purchase history. The *action* of initiating and carrying out customization is the responsibility of the *user* or the *system*. Customization initiated and carried out by the user is generally known as static

application of customization, while system initiated and executed customization is commonly described as dynamic application of customization. However, in some instances customization may be initiated by the user and carried out by the system or vice-versa. Arguably, these entities are inseparable and equally important hence their inclusion in some stage of the customization process is advantageous for an inclusive result.

The three types of customization outlined by Fung [4] as part of interaction process customization are used as a basis to explore potential customizations via tags. This customization category will be referred to as interaction customization hereon.

## 2.2 Tags / Tagging

Tags, also known as user-defined metadata are a popular Web 2.0 technology, enabling users to assign keywords to Web resources (e.g., photo, video, people, etc) primarily for the purpose of personal information management (PIM). Tags are largely personal and contextual [6], and considered as a potential source of knowledge [7]. Recognized as an easy-to-use, dynamic and engaging technology, tags aid users to recall and retrieve information content and when represented as tag clouds they facilitate visual information retrieval [8]. Also, the underlying meanings of tags may be discovered through semantic analysis to form associations between like-minded individuals [7].

In the financial services space, tags are widely used to assist personal financial management via third party tools such as Mint<sup>2</sup> and Yodlee<sup>3</sup>, where a user can assign tags to annotate transactional data for purposes such as budgeting, expense tracking, etc. However, these tools, allow tags to be assigned to financial transactions at a high level as category or description, but not at a lower level for details such as bank account, biller, description, etc. There may be compelling advantages in doing so in the online banking environment, opening doors to tag-based interactions alongside personal financial management. Although the ability to tag financial data has existed for a while now primarily through third party tools, this trend is likely to change with banks considering the inclusion of personal financial management features. This view is particularly evident among Australian banks who have begun to do so as part of their offerings with Australia and New Zealand Bank (ANZ) pioneering the initiative through its ANZ-MoneyManager<sup>4</sup> service. The inclusion of tags as part of online banking adds to the relevance and practicality of the proposed approach to customize online banking interaction.

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<sup>2</sup> <http://www.mint.com>

<sup>3</sup> <http://www.yodlee.com>

<sup>4</sup> <http://www.anz.com/ANZ-moneymanager/default.asp>

### 3 Proposed approach

#### 3.1 Main idea

The main idea of our approach is to use user-defined tags and tag-based visualization (tag cloud) to facilitate customization in online banking. Tags and tag clouds can offer a more intuitive and interactive online banking website. Since tags represent resources in a personal manner, tags can be used to facilitate comprehension of user intentions. Possible actions may be inferred from tags based on the resources they represent and the relationships between those resources. Also, relevant tags can be recommended to users and based on semantic relations of tags across the network, related services can be aggregated and recommended, which banking users may find useful.

#### 3.2 Taggable resources

In order to define the range of taggable resources in online banking, a piece of information not readily available from the literature, a background case study was conducted. The study involved manual examination of personal banking websites of two leading banks in Australia: Commonwealth Bank<sup>5</sup> and Suncorp Bank<sup>6</sup>. Personal banking was preferred over other types of banking because it appeals to a wider base of users. Both online and mobile banking environments were considered in this study.

To identify taggable resources we observed both aforementioned online banking websites, focusing on services offered and the different information required for the services including fund transfer, bill payment, product application and internal messaging. The results of the study are presented in Table 1. A total of seven resources were identified, grouped into five categories: account, description, biller, application and message.

**Table 1.** Taggable resources

Resource Id	Category	Type / Description	Environment
R1	Account	Personal account which are user owned accounts such as every day, savings, cheque, credit card, etc	Online and Mobile
R2		Payee account which are either linked accounts such as personal accounts or other third party accounts that are internal, external or overseas	Online and Mobile
R3	Description	Personal description of a transaction as self-reference. Transaction types include offline such as EFTPOS, direct debit, etc; and online such as	Online and Mobile

<sup>5</sup> <http://www.commbank.com.au/>

<sup>6</sup> <http://www.suncorp.com.au/>

		bill pay, fund transfer, shopping, etc	
R4		Payee description of transaction for recipient's reference	Online only
R5	Biller	All types of registered and unregistered billers	Online and Mobile
R6	Application	All types of financial products such as account, credit card, loans, etc	Online and Mobile
R7	Message	Personal communication between customer and bank	Online only

The findings of the study show that the resources identified are typically available in both environments which suggest that tag-based interaction is applicable to different contexts. However, it is noteworthy that mobile banking to a large extent only supports the use of pre-existing resources rather than new resources. For example, a fund transfer can only be carried out to a saved payee but not to a new payee in which case the payee information has to be added through the online environment. This is possibly due to the inconvenience of entering information through a mobile device or to security and privacy concerns related to the use of mobile banking.

## 4 Prototype implementation

An early prototype implementation with tag integration for a few key resources namely account, description and biller has been developed. The prototype is software-based, intended to demonstrate the mechanics of each customization particularly in the desktop environment for two main activities: bill payment and fund transfer. Although the prototype is still in its early days, it extends support to the proposed approach especially in terms of feasibility and practicality.

The following sub-sections elaborate the different types of interaction customization and the proposed use of tags to address them. The examples largely depict scenarios of day to day online banking activities.

### 4.1 Remembrance-based customization

This customization type is defined as the ability to provide customization through simple remembering of a user's information based on the recurrence rate of a particular action on a website [4].

Remembering-type customization can be fulfilled through tags assigned to resources that are presented as tag clouds. This provides a visual retrieval interface that can simplify and ease the execution of past or recurring transactions. Simply by clicking on a tag, related information about a transaction that the tag is associated with can be retrieved and displayed. If a selected tag is associated with two or more tags then the tag cloud can be filtered to show tags which are co-occurring with the selected tag. This removes the need to navigate to a different page or perform a manual search query. This also means for carrying out a past or recurring transaction,

users will only need to update necessary information such as amount (if different) and possibly retain other details such as bank accounts and description.

Based on user's tagged resources namely transaction description, remembrance-based customization is introduced. The following example assumes a user pays a monthly mobile bill and tagged the transaction as "mobile" in the first month, and the following month the user returns to carry out the same activity.

*Scenario 1: Mobile bill payment. User clicks on "mobile" tag (1) from the tag cloud. As a result, the bill payment form is automatically completed.*

**BPAY**

april car dec dinner forex gift guess home  
insurance march **mobile** movie tax voip

Click on tag to load a previous or recurring transaction.

\*From Account

Savings Everyday Cheque Visa  
Mastercard

Selected account:

\*To Biller

Vodafone x OzForex x  
City Council x ING x add a tag

Selected biller:

Transaction Description

add a tag

\*Reference Number

\*Amount

\*When

Submit Reset

**Fig. 2.** Bill payment (initial form + user click (1))

**BPAY**

april car dec dinner forex gift guess home  
insurance march **mobile** movie tax voip

\*From Account

Savings **Everyday** Cheque Visa  
Mastercard

Selected account: **Everyday**

\*To Biller

**Vodafone** x OzForex x  
City Council x ING x add a tag

Selected biller: **Vodafone**

Transaction Description

**mobile** x add a tag

\*Reference Number

3829723023 Vodafone

\*Amount

50 Vodafone

\*When

Submit Reset

**Fig. 3.** Bill payment\* (completed form)

\*The selected tag (“*mobile*”) from the tag cloud is highlighted (underline) and the transaction details are loaded and the account and biller tags (“*Everyday*” & “*Vodafone*”) are automatically selected (tick icon).

## 4.2 Comprehension-based customization

This customization type is defined as the ability to recognize user’s behaviors and provide assistance towards fulfilling the user’s needs [4].

Comprehension-type customization can be fulfilled by inferring banking actions like fund transfer based only on tags selected by the user. Such inference is possible particularly for tags with certain types of relations such as two bank accounts. These relations when combined with simple pre-defined rules can aid in populating relevant actions. A sample pre-defined rule is the ability to transfer funds from savings account to credit card account but not the other way around due to nature of the accounts. However, it would be possible to transfer two-ways between a savings account and a current account. The default choice for the suggested actions can be made based on past user actions to closely reflect user’s needs. However, as a key HCI design rule, it is important not to automatically carry out an action to ensure the locus of control remains with the user [9].

Based on user’s tagged resources namely accounts and billers, the comprehension-based customization is detailed. This customization is realized through user selection of tags, where a set of actions are inferred by analyzing the relations between tags selected. This allows users to carry out their banking activities with minimal effort. This is achieved by examining the tripartite structure of tags comprising of user, tag and resource and subsequently, applying pre-defined rules to the underlying resources. Rules are defined for a particular resource owned by a user such as bank account based on account type. For example, a savings account would have three rules: *transfer\_from*, *transfer\_to* and *view*, which denotes that the account can be used to send or receive money, and be viewed. Meanwhile a credit card account (e.g., “*Visa*”) would only have two rules: *transfer\_to* and *view*, which denotes that the account can only receive money and be viewed. Similarly, a payee account (e.g., “*Dad*”) would also have the same set of rules as the credit card account. The account with ‘*transfer\_from*’ action will always act as the sender/primary account while the account with ‘*transfer\_to*’ action will act as the recipient/secondary account. In the event tags of two accounts with ‘*transfer\_from*’ action are selected, it would be possible to have identical actions of transferring and receiving funds between both accounts. In order to reduce the overall complexity involving multiple accounts, a limit for the number of selectable tags particularly for personal accounts is desirable (refer to Table 1 for account types).

The following examples show the ability of conducting an internal and external fund transfers just by selecting tags. Although the examples only illustrate fund transfers to a single account, it is possible to carry out fund transfers to multiple accounts at once.

*Scenario 2: Internal fund transfer from Savings to Everyday account. User clicks on “Savings” (1) and “Everyday” (2) tags, a set of possible actions for these accounts are populated. The suggested actions are 1) ‘Transfer from Savings to Everyday’, 2)*



*‘Transfer from Everyday to Savings’ and 3) ‘View transaction history of Savings and Everyday’.*

**Fig. 4.** Internal fund transfer

*Scenario 3: External fund transfer from Everyday to John’s account. User clicks on “Everyday” (1) and “John” (2) tags, a set of possible actions for these accounts are populated. The suggested actions are 1) ‘Transfer from Everyday to John’ and 2) ‘View transaction history of Everyday and John’*

**Fig.5.** External fund transfer

### 4.3 Association-based customization

This customization type is defined as the ability to provide customization through association of user’s behavior with other individuals who share similar interests or needs[4].

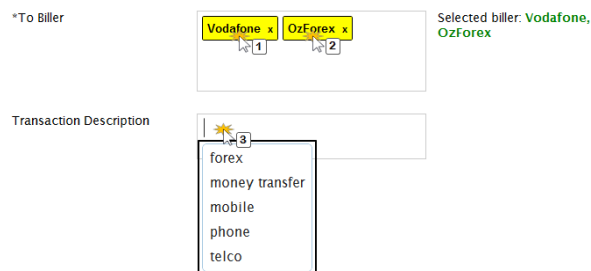
Associative-type customization can be fulfilled through tag recommendation to users primarily as suggestions in the form of dropdown box or visually through the use of tag clouds to display related tags. The semantics of tags can be used to find closer association between tags across the network and to select/rank the most relevant sets of tags based on similarity score [7]. Based on the derived tags, information about related services may also be aggregated. This information can

possibly aid the discovery of services which otherwise may not been known to users. This is particularly appropriate in light of an integrated online banking bill payment service such as BPay<sup>7</sup> in Australia, participated by merchants and service providers throughout the country. However, aggregation of services based on tag-relatedness is more likely to be useful for services that can be easily abandoned.

Based on user's tagged resources namely biller and description, association-based customization is explicated. The associations are divided into tag suggestions and tag-based service aggregation. Both these associations are based on two sets of tags: personal and public (cross-network). For tag suggestions, personal tags take precedence over public tags, and the most relevant public tags can be suggested based on number of associations to a resource. To improve the relevance of tags suggested to an individual, analysis of semantic relatedness is useful [7]. Additionally, by analyzing the semantics relatedness of tags, similar services may be discovered and aggregated. This is based on the notion that tags with high semantic relatedness are likely to represent a similar type of biller. In order to ascertain the similarity of discovered billers, further validation can be carried out based on attributes such as industry type, nature of business, etc. For this purpose, semantic databases like Freebase<sup>8</sup> and local business directories can be used. Although semantic analysis of tags can aid in personalizing tag recommendation [7], it is subject to good levels of semantics in tag sets. The outcome of semantic analysis can be undermined by the presence of idiosyncratic tags that carry strong personal connotations. One possible solution is tag reuse through tag suggestions [10], which can potentially reduce the use of idiosyncratic tags over time. Also, the utility of tag-based service aggregation may entail reciprocal action from users to tag with a reduced personal sense.

The following examples illustrate this customization by assuming a user carries out two select bill payments to two billers: Vodafone (mobile) and OzForex (foreign currency exchange).

*Scenario 4: Tag recommendation for multiple bill payment (mobile and money transfer). User clicks on "Vodafone" (1) and then "OzForex" (2) biller tags, and clicks to enter a description tag (3). As a result, a set of related tags are recommended that are used in the context of the selected billers.*

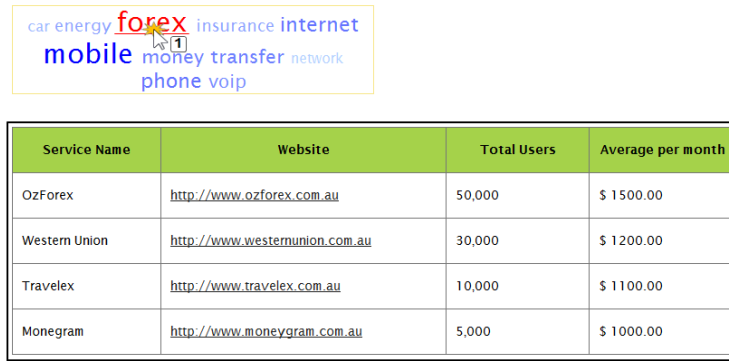


**Fig. 6.** Tag recommendation (suggestion)

<sup>7</sup> <http://www.bpay.com.au/>

<sup>8</sup> <http://www.freebase.com/>

*Scenario 5: Tag-based services recommendation. User clicks on “forex” (1) tag, related services are populated with aggregated information on service usage.*



**Fig. 7.** Tag recommendation (service aggregation)

Figure 7 shows a table of foreign currency exchange services with aggregated information such as total users and average per month. Such information can allow users to discover related services with the aggregated details serving as a practical rating for services. In the above context, the service with the highest users and average may be perceived to offer a more competitive exchange rate than the rest. Even in cases where the aggregated information is not very useful, users may still benefit solely from discovery of services.

## 5 Conclusion & Future Work

This paper firstly provides a conceptual understanding of interaction-focused customization in the larger customization domain. Secondly, it defines the range of user taggable resources in both online and mobile banking environments. Thirdly, a practical view of the proposed tag-based interaction is offered via a preliminary prototype implementation. The main point of interest of the research lies in the potential use of tags to facilitate personalized banking interactions. The preliminary prototype highlights this specifically in the desktop environment. The ability to employ a light-weight user-driven technology such as tags to facilitate various interaction customization types is advantageous and useful, and may be achieved with minimal effort for implementation and adoption. However, a drawback to using tags is the lack of detailed information about resources which they represent that may be needed to ensure correct use of online banking. Even though the ability to recall information as a form of self-communication is significant with tags [11], users may still want to view detailed information about a resource. One possible solution is to provide detailed information about tagged resources on demand in the form of dynamic tooltip as a simple hover effect on desktop and tap and hold action on mobile devices. The use of dynamic tooltips also allows the most up-to-date information such

as balance amount to be shown on the fly, which is important for carrying out a transaction.

From here, we envisage further exploration of tags and tag clouds in the mobile environment, particularly addressing the spatial constraint present. This can highlight other form of interaction techniques which may help to better achieve the different customization types. Also, we will focus on evaluating the prototype with the aim of assessing its utility and usability in both online and mobile environments as they are key factors of user performance, satisfaction and acceptance [12]. This will allow us to explore ways in which the prototype can be improved. The proposed method of evaluation is experimentation using a pretest-posttest control group design. This design would provide strong internal validity, suitable to measure cause-effect relationships [13]. Each customization type will be evaluated separately in a similar fashion to Fung's study [4] and experiential feedback from participants will be gathered using a posttest questionnaire. The feedback will be used to improve the prototype incrementally for the upcoming experiments. The results of the experiments are expected to indicate the suitability of the customizations in the online banking context and also inform a set of guidelines for the design and implementation of tag-based customizations.

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